

A New Method to Control the Airborne Transmission of all Variants of Sars-Cov-2 and Other Virus

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Abstract:

Prevention is better than cure – an effective method of ventilation is proposed that can control the spread of all variants of Sars-CoV-2 and other virus by airborne transmission.

Keywords: Covid-19; Virus; Aerosol; Ventilation; Thermal Inactivation

Introduction

The infection of covid-19 is increasing day by day around the world and new variants of SARS-CoV-2 virus are associated with each wave of infections. Any covid-19 patient is a mobile factory of producing a huge number of SARS-CoV-2 virus. There is an invisible jacket of SARS-CoV-2 virus around each covid-19 patient and if such patients are allowed to move around then any person who comes in contact with the patient can be infected by the virus easily. Any infected person suffering from low immunity is more likely to be hit badly by virus. This is true for all including Doctors and paramedical staff.

The SARS-CoV-2 virus could be transmitted through various routes like respiratory tiny droplets/ virus aerosol [1,2], by touching infected surfaces (fomites) [3] or through airborne transmission [4]. Recently, a number of scientific reasons have been reported to support that SARS-CoV-2 virus spreads by airborne transmission [5-7]. If this virus is air borne in nature then it can spread very quickly and can increase the rate of infection to a great extent. So far, scientific community is being puzzled by the spread of the infection caused by SARS-CoV-2 virus as all methods used to contain it have failed.

A proper ventilation of room air was suggested as it is known to reduce the viral load due to air borne nature of the virus [7]. But if the air of covid-19 patients' ward is simply vent out through ordinary ventilation then it is going to be diluted outside, but if it is able to survive outside as aerosol then it can increase the number of covid-19 patients and thus ordinary ventilation could be a dangerous option.

A number of studies about the effects of temperature on SARS-CoV-2 have been reported [8-11]. An integrative review by J. P. Abraham et al. [8] provided details of thermal inactivation of SARS-CoV-2 and other corona viruses. And it was recommended to kill viruses available on all possible objects by use of thermal inactivation. Another interesting report [9] provided the details of the effects of temperature and relative humidity on rate of inactivation for SARS-CoV-2. The rate of inactivation of virus was found to increase with increase in temperature at constant relative humidity. The other reports [10,11] explained the temperature controlled molecular and structural dynamics of SARS-CoV-2 proteins.

A new effective method of ventilation is proposed on the basis of above-mentioned studies about airborne nature and thermal inactivation of SARS-CoV-2 to kill all the viruses if present in air. The human respiratory system (lungs) is known to create suction slightly above the atmospheric pressure which is sufficient enough to inhale (suck in) the SARS-CoV-2 and other virus if present in air. This effective method of ventilation is based on two points: (1) If the virus is airborne in nature, then it should be easier to drag the SARS-CoV-2 and all other virus to a duct or pipe with the help of push (air pump) and pull (vacuum pump) method at higher pressure. (2) To kill the SARS-CoV-2 and other virus by thermal inactivation. All three functions (push, pull and heating) are performed efficiently by a normal hair dryer - a common household item. However, its use would not be effective practically to create effective ventilation to reduce viral load in a medical ward of covid-19 patients. However, an effective ventilation system can be designed on the same basis depending upon the place of

requirement. For making such ventilation system, an especially designed large metallic pipe or chimney fitted with non-emission source of energy (electrical heating elements inside the pipe to maintain the desired temperature) and a vacuum or air pump to drag the room air into chimney is required.

For the effective ventilation of viral load of covid-19 ward, the room air should be dragged into a preheated especially designed large metallic pipe or chimney by non-emission source of energy (electrical heating elements inside the pipe) at high temperature above 75°C with the help of vacuum or air pump, where all viruses would get thermally inactivated at constant relative humidity as reported in the literature [9]. It is very likely to work very effectively if the nature of transmission of SARS-CoV-2 virus is mainly airborne.

Suggestions

The viruses get clung easily to exposed parts of skin, hands and clothes. Therefore, skin and hands should be washed regularly with the soap in order to get rid of the virus. Clothes should be washed immediately after use.

A proper ventilation of room air should be maintained.

If possible, try to kill viruses available on all objects and surfaces by appropriate use of thermal inactivation and disinfectants.

Apply effective method of ventilation appropriately wherever possible to reduce the viral load.

It has been noticed in most of the videos shown by various news channels that the doctors and paramedical staff performing the test for covid-19 and the used test kits were kept open in air-conditioned room / lab which are not well ventilated (caution: used RT-PCR or RAT test kits must be kept in a fume hood fitted adequately with effective method of ventilation). In such places the virus is known to be airborne for longer time. The viral load will increase if the doctors and paramedical staff attend a number of covid-19 patients in such places and it will keep them on high risk of infection. The ventilation outlet of the indoors/labs or the air of covid-19 patients' ward should be directed to effective method of ventilation.

The SARS-CoV-2 virus and its variants are spreading easily from one country to other countries through civil aviation. It is a bit difficult to detect covid-19 virus in asymptomatic patients by RT-PCR or RAT methods before air travel and such patients are more likely to spread the virus during the flight. However, it could be controlled/ contain by strict ban on air travel during pandemic. It could also be contained to a great extent by treating/ flushing each airplane before departure with a warm air (30-35°C) blower from one end of the airplane and then should be vent out into a hot chimney from the other end to destroy virus by thermal inactivation. And a similar procedure must be repeated just after arrival of the airplane. Thus, it could be possible to control the spread of SARS-CoV-2 virus to a great extent by air travel and the risks of infection by virus in such flight could be minimized.

Similarly, the viral load of indoors of hospitals, shopping malls and other big buildings like airports, worship places can be reduced by effective method of ventilation.

For reducing viral load in outdoors particularly in crowded places like markets and public gatherings a specially designed long chimneys like minarets well equipped with heating elements and air pump could be used.

This effective method of ventilation could also serve the purpose of air purifier provided the non-emission source of fire is used. Similarly, a small size air purifier could also be designed for inside of the airplane during the flight to inactivate the virus if present by passing its air into hot metallic tubing preheated at high temperature (above 75°C) first and then to a tubing cold enough to bring it to desired temperature. The resulting out coming air will be free of all viruses. This device can serve as a good air filter (or air purifier) to remove the virus on board. But it may require many corrective measurements and trials to prove its potential for this application.

Conclusion

The effective method of ventilation could minimize / control the spread of SARS-CoV-2 virus to a great extent provided that the virus is mostly spreading through airborne transmission. This method could have a great impact to control the spread of SARS-CoV-2 virus as it provides an extra solution to contain the virus, apart from washing hands, skin with soap, using heat to kill the virus by thermal inactivation and disinfecting the surfaces (fomites).

It is a simple method and easy to handle. If required help of any synthetic chemist with experience of Schlenk apparatus/ glove box can be taken. Such chemists can execute it with great efficiency.

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